

# MC78L00A Series, NCV78L05A

## 100 mA Positive Voltage Regulators

The MC78L00A Series of positive voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100 mA. Like their higher powered MC7800 and MC78M00 Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the MC78L00 devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.

- Wide Range of Available, Fixed Output Voltages
- Low Cost
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (MC79L00A Series)

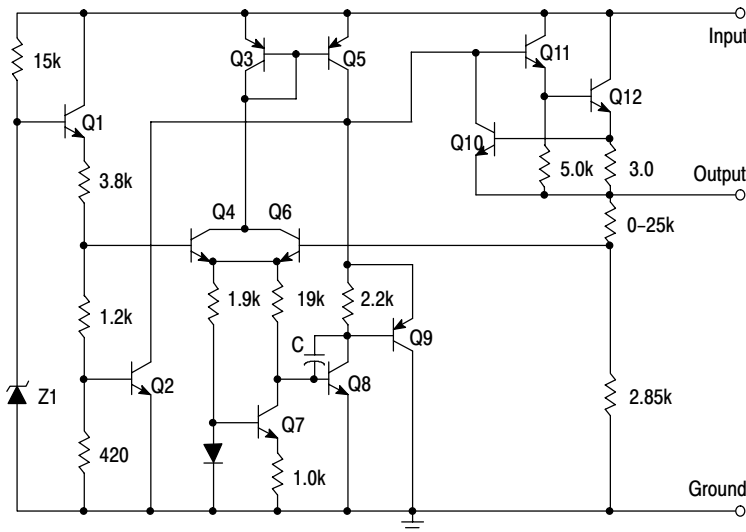


Figure 1. Representative Schematic Diagram

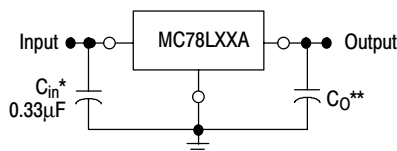


Figure 2. Standard Application

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

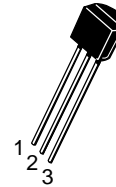
\*  $C_{in}$  is required if regulator is located an appreciable distance from power supply filter.

\*\*  $C_O$  is not needed for stability; however, it does improve transient response.



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TO-92  
P SUFFIX  
CASE 029

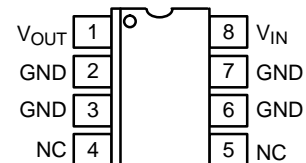
Pin: 1. Output  
2. Ground  
3. Input



SOP-8\*  
D SUFFIX  
CASE 751

\*SOP-8 is an internally modified SO-8 package. Pins 2, 3, 6, and 7 are electrically common to the die attach flag. This internal lead frame modification decreases package thermal resistance and increases power dissipation capability when appropriately mounted on a printed circuit board. SOP-8 conforms to all external dimensions of the standard SO-8 package.

### PIN CONNECTIONS



(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 10 of this data sheet.

## MC78L00A Series, NCV78L05A

### MAXIMUM RATINGS ( $T_A = +125^\circ\text{C}$ , unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (2.6 V–8.0 V) (12 V–18 V) (24 V)	$V_I$	30 35 40	Vdc
Storage Temperature Range	$T_{\text{stg}}$	–65 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	0 to +150	$^\circ\text{C}$

### ELECTRICAL CHARACTERISTICS ( $V_I = 10\text{ V}$ , $I_O = 40\text{ mA}$ , $C_I = 0.33\ \mu\text{F}$ , $C_O = 0.1\ \mu\text{F}$ , $-40^\circ\text{C} < T_J < +125^\circ\text{C}$ (for MC78LXXAB, NCV78L05A), $0^\circ\text{C} < T_J < +125^\circ\text{C}$ (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L05AC, AB, NCV78L05A			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	4.8	5.0	5.2	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $7.0\text{ Vdc} \leq V_I \leq 20\text{ Vdc}$ $8.0\text{ Vdc} \leq V_I \leq 20\text{ Vdc}$	$\text{Reg}_{\text{line}}$	– –	55 45	150 100	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	– –	11 5.0	60 30	mV
Output Voltage ( $7.0\text{ Vdc} \leq V_I \leq 20\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 10\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	4.75 4.75	– –	5.25 5.25	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	– –	3.8 –	6.0 5.5	mA
Input Bias Current Change ( $8.0\text{ Vdc} \leq V_I \leq 20\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	– –	– –	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	40	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $8.0\text{ Vdc} \leq V_I \leq 18\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	41	49	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

NOTE: NCV78L05A:  $T_{\text{low}} = -40^\circ\text{C}$ ,  $T_{\text{high}} = +125^\circ\text{C}$ . Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

## MC78L00A Series, NCV78L05A

**ELECTRICAL CHARACTERISTICS** ( $V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L08AC, AB			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	7.7	8.0	8.3	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $10.5\text{ Vdc} \leq V_I \leq 23\text{ Vdc}$ $11\text{ Vdc} \leq V_I \leq 23\text{ Vdc}$	$\text{Reg}_{\text{line}}$	– –	20 12	175 125	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	– –	15 8.0	80 40	mV
Output Voltage ( $10.5\text{ Vdc} \leq V_I \leq 23\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 14\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	7.6 7.6	– –	8.4 8.4	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	– –	3.0 –	6.0 5.5	mA
Input Bias Current Change ( $11\text{ Vdc} \leq V_I \leq 23\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	– –	– –	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	60	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $12\text{ V} \leq V_I \leq 23\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	37	57	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

**ELECTRICAL CHARACTERISTICS** ( $V_I = 15\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L09AC, AB			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	8.6	9.0	9.4	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $11.5\text{ Vdc} \leq V_I \leq 24\text{ Vdc}$ $12\text{ Vdc} \leq V_I \leq 24\text{ Vdc}$	$\text{Reg}_{\text{line}}$	– –	20 12	175 125	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	– –	15 8.0	90 40	mV
Output Voltage ( $11.5\text{ Vdc} \leq V_I \leq 24\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 15\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	8.5 8.5	– –	9.5 9.5	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	– –	3.0 –	6.0 5.5	mA
Input Bias Current Change ( $11\text{ Vdc} \leq V_I \leq 23\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	– –	– –	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	60	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $13\text{ V} \leq V_I \leq 24\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	37	57	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

## MC78L00A Series, NCV78L05A

**ELECTRICAL CHARACTERISTICS** ( $V_I = 19\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_1 = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L12AC, AB			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	11.5	12	12.5	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $14.5\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ $16\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$	$\text{Reg}_{\text{line}}$	– –	120 100	250 200	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	– –	20 10	100 50	mV
Output Voltage ( $14.5\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 19\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	11.4 11.4	– –	12.6 12.6	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	– –	4.2 –	6.5 6.0	mA
Input Bias Current Change ( $16\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	– –	– –	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	80	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $15\text{ V} \leq V_I \leq 25\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	37	42	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

**ELECTRICAL CHARACTERISTICS** ( $V_I = 23\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_1 = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L15AC, AB			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	14.4	15	15.6	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $17.5\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ $20\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$	$\text{Reg}_{\text{line}}$	– –	130 110	300 250	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	– –	25 12	150 75	mV
Output Voltage ( $17.5\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 23\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	14.25 14.25	– –	15.75 15.75	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	– –	4.4 –	6.5 6.0	mA
Input Bias Current Change ( $20\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	– –	– –	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	90	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $18.5\text{ V} \leq V_I \leq 28.5\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	34	39	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

## MC78L00A Series, NCV78L05A

**ELECTRICAL CHARACTERISTICS** ( $V_I = 27\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $0^\circ\text{C} < T_J < +125^\circ\text{C}$ , unless otherwise noted.)

Characteristics	Symbol	MC78L18AC			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	17.3	18	18.7	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) 21.4 Vdc $\leq V_I \leq 33\text{ Vdc}$ 20.7 Vdc $\leq V_I \leq 33\text{ Vdc}$ 22 Vdc $\leq V_I \leq 33\text{ Vdc}$ 21 Vdc $\leq V_I \leq 33\text{ Vdc}$	$\text{Reg}_{\text{line}}$	–	45	325	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	–	30	170	mV
Output Voltage (21.4 Vdc $\leq V_I \leq 33\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) (20.7 Vdc $\leq V_I \leq 33\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 27\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ ) ( $V_I = 27\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	17.1	–	18.9	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	–	3.1	6.5	mA
Input Bias Current Change (22 Vdc $\leq V_I \leq 33\text{ Vdc}$ ) (21 Vdc $\leq V_I \leq 33\text{ Vdc}$ ) (1.0 mA $\leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	–	–	1.5	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	150	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $23\text{ V} \leq V_I \leq 33\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	33	48	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

**ELECTRICAL CHARACTERISTICS** ( $V_I = 33\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $0^\circ\text{C} < T_J < +125^\circ\text{C}$ , unless otherwise noted.)

Characteristics	Symbol	MC78L24AC			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	23	24	25	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) 27.5 Vdc $\leq V_I \leq 38\text{ Vdc}$ 28 Vdc $\leq V_I \leq 80\text{ Vdc}$ 27 Vdc $\leq V_I \leq 38\text{ Vdc}$	$\text{Reg}_{\text{line}}$	–	–	–	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	–	40	200	mV
Output Voltage (28 Vdc $\leq V_I \leq 38\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) (27 Vdc $\leq V_I \leq 38\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) (28 Vdc $\leq V_I \leq 33\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ ) (27 Vdc $\leq V_I \leq 33\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	22.8	–	25.2	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	–	3.1	6.5	mA
Input Bias Current Change (28 Vdc $\leq V_I \leq 38\text{ Vdc}$ ) (1.0 mA $\leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	–	–	1.5	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	–	200	–	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $29\text{ V} \leq V_I \leq 35\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	31	45	–	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	–	1.7	–	Vdc

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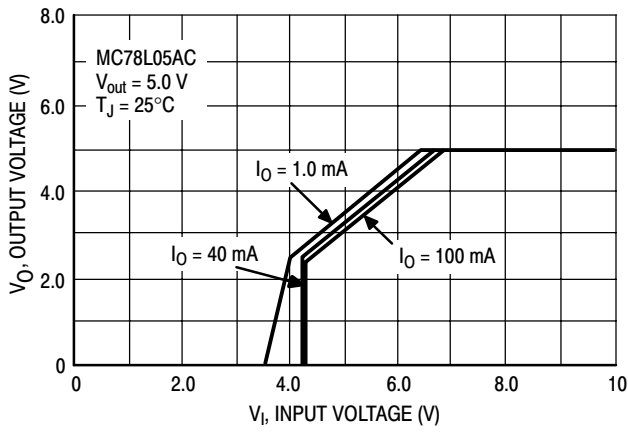


Figure 3. Dropout Characteristics

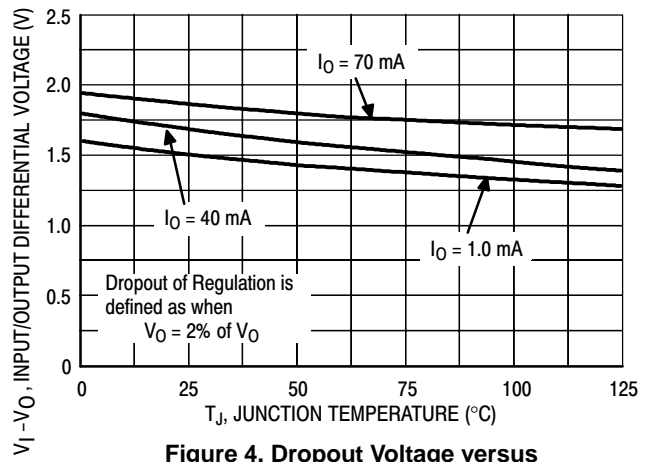


Figure 4. Dropout Voltage versus Junction Temperature

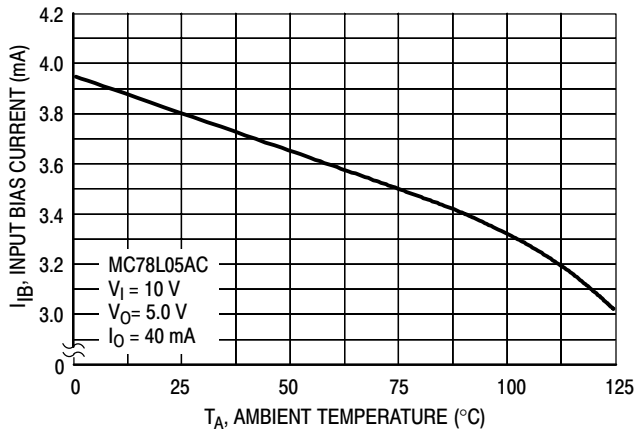


Figure 5. Input Bias Current versus Ambient Temperature

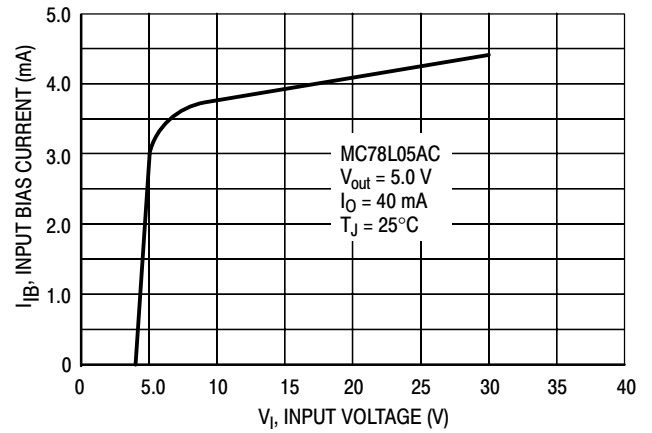


Figure 6. Input Bias Current versus Input Voltage

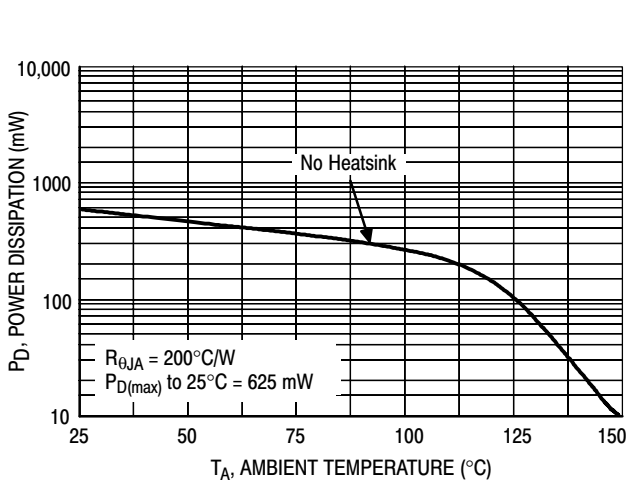


Figure 7. Maximum Average Power Dissipation versus Ambient Temperature – TO-92 Type Package

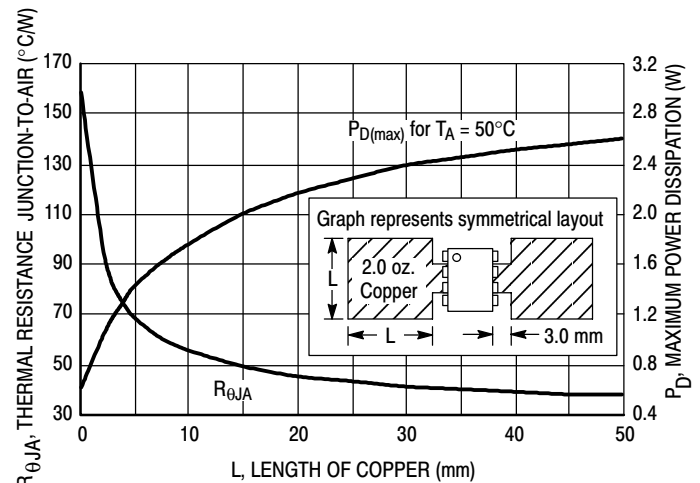


Figure 8. SOP-8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

# MC78L00A Series, NCV78L05A

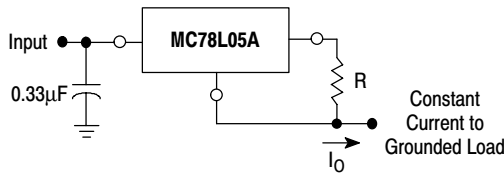
## APPLICATIONS INFORMATION

### Design Considerations

The MC78L00A Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition. Internal Short Circuit Protection limits the maximum current the circuit will pass.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. The

input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead. Bypassing the output is also recommended.



The MC78L00 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC78L05C is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0 \text{ V}}{R} + I_B$$

$$I_B = 3.8 \text{ mA over line and load changes}$$

For example, a 100 mA current source would require R to be a 50 Ω, 1/2 W resistor and the output voltage compliance would be the input voltage less 7 V.

Figure 9. Current Regulator

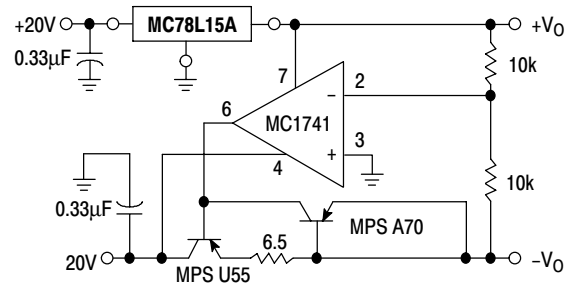


Figure 10. ± 15 V Tracking Voltage Regulator

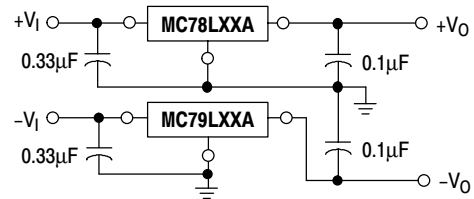


Figure 11. Positive and Negative Regulator

## MC78L00A Series, NCV78L05A

### ORDERING INFORMATION

Device	Output Voltage	Operating Temperature Range	Package	Shipping	
MC78L05ABD	5.0 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail	
MC78L05ABDR2			SOP-8	2500 Tape & Reel	
NCV78L05ABDR2*			SOP-8	2500 Tape & Reel	
MC78L05ABP			TO-92	2000 Units/Bag	
MC78L05ABPRA			TO-92	2000 Tape & Reel	
MC78L05ABPRE			TO-92	2000 Units/Bag	
MC78L05ABPRM			TO-92	2000 Ammo Pack	
MC78L05ACD		$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail	
MC78L05ACDR2			SOP-8	2500 Tape & Reel	
MC78L05ACP			TO-92	2000 Units/Bag	
MC78L05ACPRA			TO-92	2000 Tape & Reel	
MC78L05ACPRE			TO-92	2000 Tape & Reel	
MC78L05ACPRM			TO-92	2000 Ammo Pack	
MC78L05ACPRP			TO-92	2000 Ammo Pack	
MC78L08ABD		8.0 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail
MC78L08ABDR2				SOP-8	2500 Tape & Reel
MC78L08ABP	TO-92			2000 Units/Bag	
MC78L08ABPRA	TO-92			2000 Tape & Reel	
MC78L08ABPRP	TO-92			2000 Units/Bag	
MC78L08ACD	$T_J = 0^\circ \text{ to } +125^\circ \text{C}$		SOP-8	98 Units/Rail	
MC78L08ACDR2			SOP-8	2500 Tape & Reel	
MC78L08ACP			TO-92	2000 Units/Bag	
MC78L08ACPRA			TO-92	2000 Tape & Reel	
MC78L08ACPRE			TO-92	2000 Tape & Reel	
MC78L08ACPRP			TO-92	2000 Ammo Pack	
MC78L09ABD	9.0 V		$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail
MC78L09ABDR2				SOP-8	2500 Tape & Reel
MC78L09ABPRA				TO-92	2000 Units/Bag
MC78L09ABPRP				TO-92	2000 Units/Bag
MC78L09ACD			$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail
MC78L09ACDR2		SOP-8		2500 Tape & Reel	
MC78L09ACP		TO-92		2000 Units/Bag	

\*NCV78L05A:  $T_{\text{low}} = -40^\circ \text{C}$ ,  $T_{\text{high}} = +125^\circ \text{C}$ . Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.



## MC78L00A Series, NCV78L05A

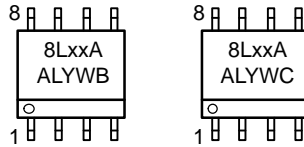
### ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping		
MC78L12ABD	12 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail		
MC78L12ABDR2			SOP-8	2500 Tape & Reel		
MC78L12ABP			TO-92	2000 Units/Bag		
MC78L12ABPRP			TO-92	2000 Units/Bag		
MC78L12ACD		$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail		
MC78L12ACDR2			SOP-8	2500 Tape & Reel		
MC78L12ACP			TO-92	2000 Units/Bag		
MC78L12ACPRA			TO-92	2000 Tape & Reel		
MC78L12ACPRE			TO-92	2000 Tape & Reel		
MC78L12ACPRM			TO-92	2000 Ammo Pack		
MC78L12ACPRP			TO-92	2000 Ammo Pack		
MC78L15ABD			15 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOP-8	98 Units/Rail
MC78L15ABDR2	SOP-8	2500 Tape & Reel				
MC78L15ABP	TO-92	2000 Units/Bag				
MC78L15ABPRA	TO-92	2000 Tape & Reel				
MC78L15ABPRP	TO-92	2000 Units/Bag				
MC78L15ACD	$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOP-8		98 Units/Rail		
MC78L15ACDR2		SOP-8		2500 Tape & Reel		
MC78L15ACP		TO-92		2000 Units/Bag		
MC78L15ACPRA		TO-92		2000 Tape & Reel		
MC78L15ACPRP		TO-92		2000 Ammo Pack		
MC78L18ABP		18 V		$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	TO-92	2000 Units/Bag
MC78L18ACP				$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	TO-92	2000 Units/Bag
MC78L18ACPRA	TO-92		2000 Tape & Reel			
MC78L18ACPRM	TO-92		2000 Units/Bag			
MC78L18ACPRP	TO-92		2000 Ammo Pack			
MC78L24ABP	24 V		$T_J = -40^\circ \text{ to } +125^\circ \text{C}$		TO-92	2000 Units/Bag
MC78L24ACP		$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	TO-92	2000 Units/Bag		
MC78L24ACPRA			TO-92	2000 Tape & Reel		
MC78L24ACPRP			TO-92	2000 Ammo Pack		

# MC78L00A Series, NCV78L05A

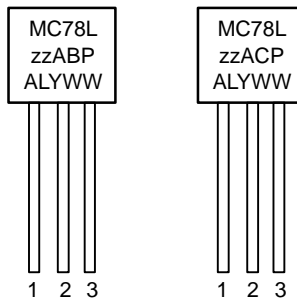
## MARKING DIAGRAMS

### SOP-8 D SUFFIX CASE 751



xx = 05, 08, 09, 12, or 15  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
B, C = Temperature Range

### TO-92 P SUFFIX CASE 029

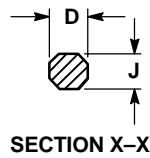
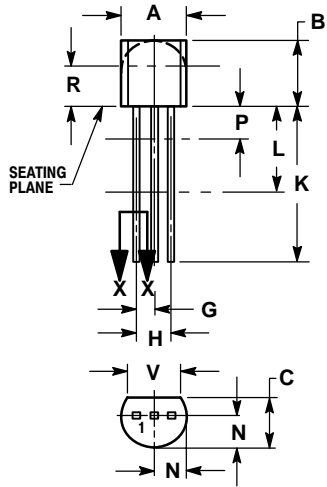


zz = 05, 08, 09, 12, 15, 18 or 24  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week

# MC78L00A Series, NCV78L05A

## PACKAGE DIMENSIONS

TO-92  
P SUFFIX  
CASE 29-11  
ISSUE AL

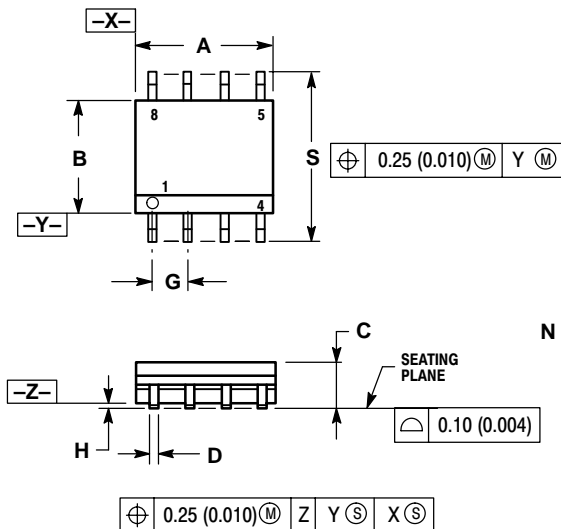


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

SOP-8  
D SUFFIX  
CASE 751-07  
ISSUE W




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0° 8°		0° 8°	
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

# MC78L00A Series, NCV78L05A

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